

Radiological Society of North America, RSNA 2013
 Refresher Course Program: Vascular Track

RC 112 – Thoracic Aorta: Key Concepts:
Surgical Procedures and Complications

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Surgical Procedures and Complications
Learning objectives – Outline

- Epidemiology / Etiology
- Surgical anatomy of thoracic aorta
- Clinical topics
 - spectrum of TA aneurysms
 - surgical procedures
 - pre- / postoperative imaging

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Thoracic Aortic Aneurysms (TAA)
(from Greek ανευρυσμα, a dilatation)

Incidence:
 TAA: 6 / 100,000 (<10% of aortic aneurysms)

Natural history / prognosis

- rupture in 32-68% of untreated pts
 rupture mortality 54% (6h), 76% (24h)
- initial size is only independent predictor of rate of growth and rupture
 - < 5 cm diameter 'low risk'
 - < 2.75cm/m² BSA: less than 4% annual risk

Thoracic Aortic Aneurysms (TAA)
Etiology and associated conditions

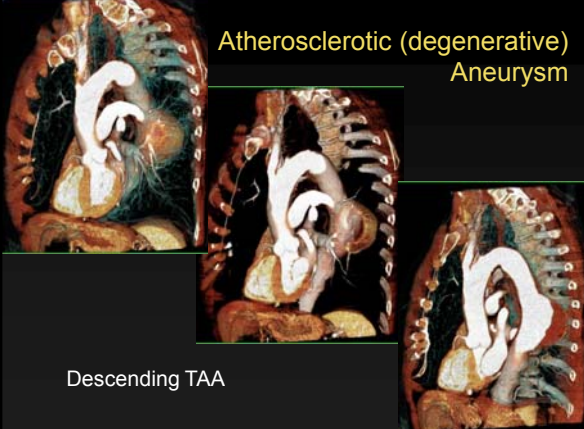
- atherosclerotic
- genetic (congenital wall defect)
 - Marfan's
 - Bicuspid aortic valve
- chronic dissection

very common

- infectious ('mycotic', syphilis)
- vasculitis
- post-traumatic

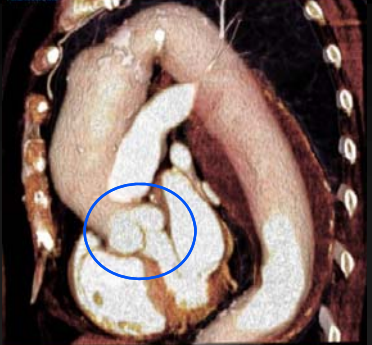
rare

Atherosclerotic (degenerative) Aneurysm



Descending TAA

75 y o woman w. atherosclerotic aneurysm of the thoracic aorta



(normal root)



Thoracic Aortic Aneurysms (TAA)
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} aortic root aneurysms

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Thoracic Aorta
Surgical Anatomy

Descending Aorta
Transverse Aorta
Ascending Aorta
Aortic Root

* Sino-tubular Junction
Sinuses of Valsalva

Thoracic Aorta Surgical Anatomy

Descending Aorta
Transverse Aorta
Ascending Aorta
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Thoracic Aorta Surgical Anatomy

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Thoracic Aorta Surgical Anatomy

Descending Aorta
Transverse Aorta
Ascending Aorta
Aortic Root

- Sinotubular junction
- Sinuses of Valsava
aortic valve
coronary ostia
- Aortic anulus

* Sino-tubular Junction
Sinuses of Valsava

• 73 y/o retired RN
ascending aortic aneurysm

• 73 y/o retired RN
ascending aortic aneurysm

MIP (thin-slab) centered at valve

• 73 y/o retired RN
ascending aortic aneurysm, root dilatation

MIP (thin-slab) centered at valve

**Preoperative and post-operative Aorta:
3D measurements and documentation**

- 3D thoracic Aorta
 - VR (candy-cane view)
- Measurements
 - MIP (5mm) ~ a-p
 - MIP (5mm) ~ lat.
 - (MPR orthogonal)
- Coronary Anatomy
 - VR
- Sinuses + valve
 - VR 'transparent'
 - MinIP (inverted)
 - 3 Chamber view



**Surgical Procedures and Complications
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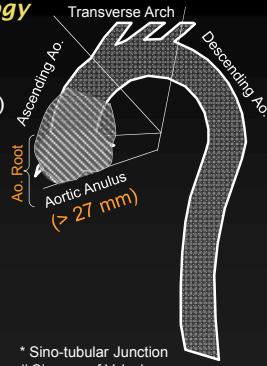
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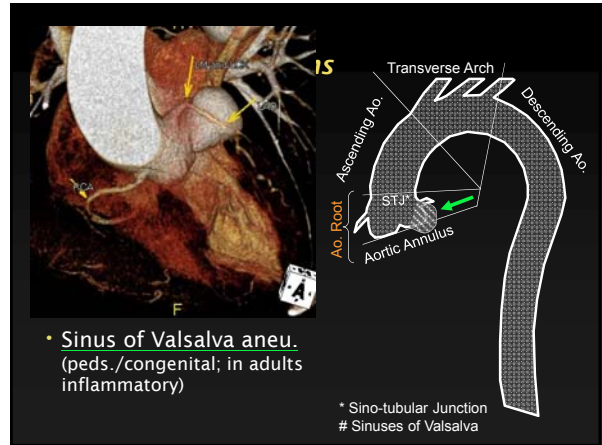
**Thoracic Aorta
Surgical Terminology**

Aortic Root

- anulo-aortic ectasia (>27)
- aortic root aneurysm if SOV, STJ (>40 mm)



* Sino-tubular Junction
Sinuses of Valsalva



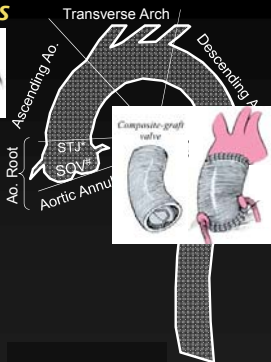
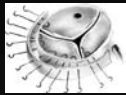
- Sinus of Valsalva aneu. (peds./congenital; in adults inflammatory)

* Sino-tubular Junction
Sinuses of Valsalva

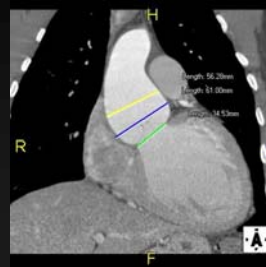
**Thoracic Aorta
Surgical Options**

Aortic Root

- Anuloplasty
- Composite graft
 - Contains valve
 - Coronary reimplant.
 - ANTICOAGULATION
- Valve Sparing Surgery



41 yo man
Marfan's



Thoracic Aorta Surgical Options

Aortic Root

- Anuloplasty
- Composite graft
 - Contains valve
 - Coronary reimplantation
- Valve Sparing Surgery
 - Resect sinuses down to valve insertions
 - Preserve (resuspend) native valves
 - Coronary reimpl.

Valve Sparing Aortic Root Procedures

Tirone David- I "Reimplantation" Technique

41 yo man Marfan's

Estimate correct anulus diameter (d):
 $d = (h_{\text{leaflet}} \times 1.35) *$
 e.g. 18mm leaflet: 24mm anulus

*mod. from David & Feindel (1992): $d = [(h_{\text{leaflet}} \times 2) \times 0.67] + (2 \times Ao_{\text{wall}})$

POST-OP

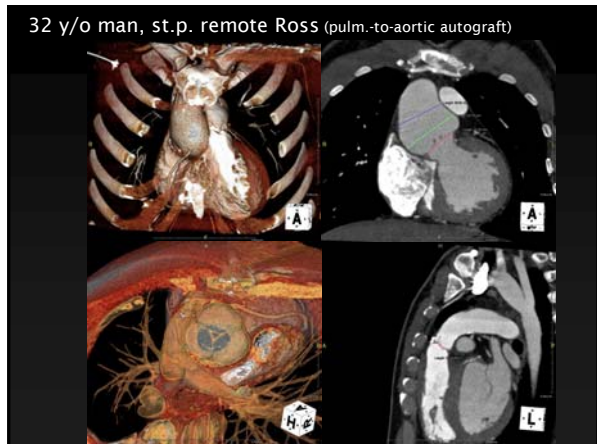
Thoracic Aorta Surgical Options

Aortic Root - synthetic

- Composite graft
- Valve Sparing Surgery

bioprosthetic

- pulm. Autograft (Ross Procedure)
- Homograft (cadaver)
- Xenograft (porcine)



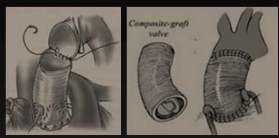

Thoracic Aorta Surgical Options

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Decellularized cryopreserved aortic homograft

J Thor Cardiovasc Surg 2005

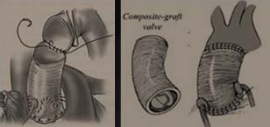

Thoracic Aorta Surgical Options

Aortic Root - synthetic

- Composite graft
- Valve Sparing Surgery

bioprosthetic

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Medtronic 'Freestyle'® porcine root graft

Thoracic Aorta Surgical Options

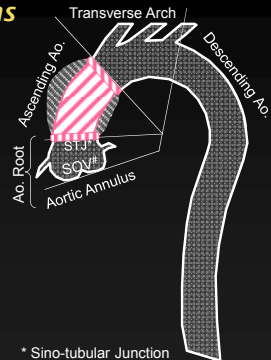
Aortic Root

Ascending Aorta

- tube graft

Transverse Aorta

Descending Aorta



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Sinuses of Valsalva

Thoracic Aorta Surgical Options

Aortic Root

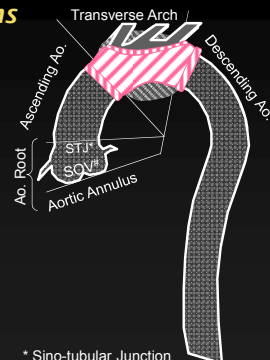
Ascending Aorta

- tube graft

Transverse Aorta

- arch reconstruction w island / peninsula for supraaortic vessels
- limbed graft

Descending Aorta



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Thoracic Aorta Surgical Options

Aortic Root

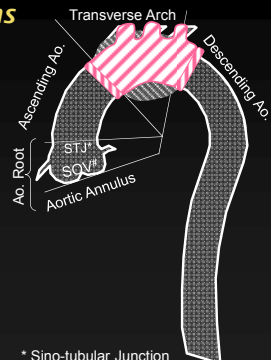
Ascending Aorta

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Descending Aorta



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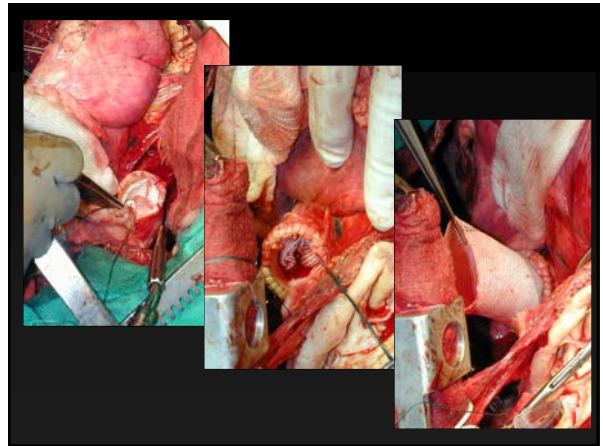
Thoracic Aorta Surgical Options

Aortic Root
Ascending Aorta + Transverse Aorta

- asc.+arch reconstr.
+ elephant trunk

Descending Aorta repair anticipated

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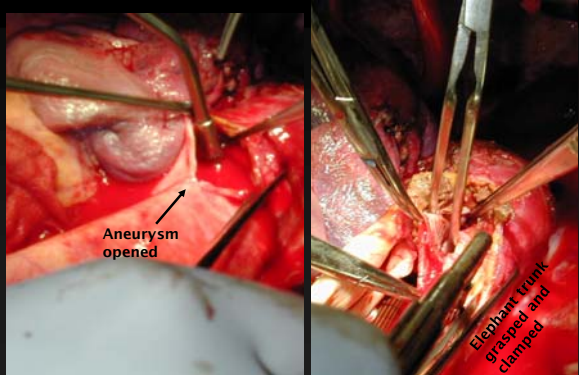
52 y/o woman with giant cell arteritis
aortic root, ascending, arch and descending aneurysm

52 y/o woman with giant cell arteritis
st.p. freestyle root, ascending and total arch repair, + elephant trunk

52 y/o woman with giant cell arteritis
st.p. freestyle root, ascending and total arch repair, + elephant trunk

52 y/o woman with giant cell arteritis
st.p. freestyle root, ascending and total arch repair, + elephant trunk

30 y/o woman, Marfans, chronic dissection, TAAA



descending TA, viewed from left lateral thoracotomy

Post-op Evaluation

62 y/o man

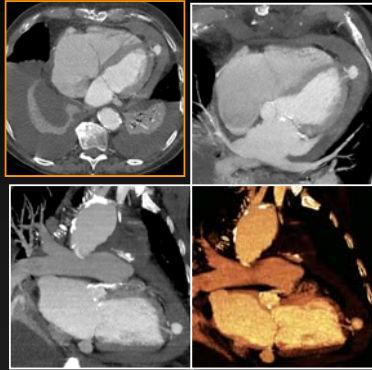
- s/p remote repair of ascending ao
 - s/p enlarging pseudoaneurysm of transverse aorta -
 - recent surg. revision
- assess aortic graft surgical site



Post-op Cardiac Evaluation

Left ventricular pseudoaneurysm

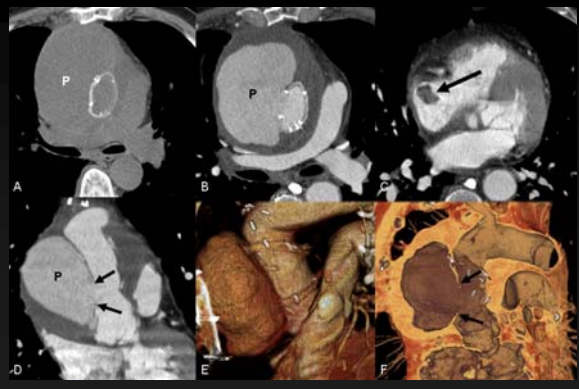
(at cannulation site for air evacuation after cardiocirc. bypass)



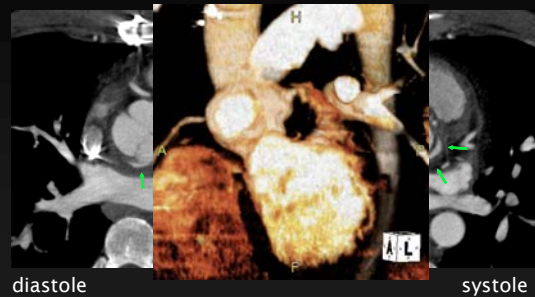
Post-surgical Imaging

- know procedure: leaks/dehiscence always at anastomosis
- non-contrast scan: felt pledgets, strips, calcifications
- ECG gating: if root involved, cine may be helpful

Pseudoaneurysm of the aorta after surgical repair



s/p Ross procedure (pulmonary-to-aorta autograft) suspected leak/pseudoaneurysm on TEE



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Thank you ...

DC Miller
RS Mitchell
M Fischbein



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